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DEPARTMENT OF NATURAL RESOURCES SUPERFUND DIVISION

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April 10, 2015

Mr. Paul Rosasco, P.E.
Engineering Management Support, Inc.
7220 West Jefferson Avenue, Suite 406
Lakewood, CO 80235

RE: Comments on *Bridgeton Landfill Thermal Isolation Barrier Investigation Phase 1 Report, Bridgeton, St. Louis County, Missouri*

Dear Mr. Rosasco:

The Missouri Department of Natural Resources (DNR), in coordination with the Missouri Department of Health and Senior Services, has completed its review of the document entitled "*Bridgeton Landfill Thermal Isolation Barrier Investigation Phase 1 Report, Bridgeton, St. Louis County, Missouri*" (hereafter referred to as the Phase 1 Report) prepared by Feezor Engineering, Inc. and P.J. Carey & Associates, in conjunction with Engineering Management Support Inc. and Auxier and Associates, Inc. dated December 2014. DNR is transmitting the enclosed comments on the Phase 1 Report.

Thank you for giving us the opportunity to review and comment on this document. If you have any questions pertaining to these comments please contact me by phone at (573)751-3107, by written correspondence at P.O. Box 176, Jefferson City, MO 65102, or by email at shawn.muenks@dnr.mo.gov.

Sincerely,

HAZARDOUS WASTE PROGRAM

Shawn Muenks, P.E.
Federal Facilities Section

SM:db

Enclosure

c: Brad Vann, U.S. Environmental Protection Agency
Chris Nagel, Solid Waste Management Program

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Missouri Department of Natural Resources (DNR)
Comments on
Bridgeton Landfill Thermal Isolation Barrier Investigation Phase 1 Report,
Bridgeton, St. Louis County, Missouri

GENERAL COMMENTS

1. Completion of Radiologically Impacted Material (RIM) Characterization:

DNR, in coordination with the Missouri Department of Health and Senior Services, provided comments by letter dated November 24, 2014 on the submittal prepared by Engineering Management Support Inc. et al. entitled "Isolation Barrier Alternatives Analysis, West Lake Landfill Superfund Site". One of the comments included in that letter addressed the "Need for Further Characterization of RIM". DNR would like to reiterate the need to complete RIM characterization in order to choose the appropriate location of the isolation barrier in a timely manner.

In addition, DNR notes that the Phase 1 Report contains Appendix A – November 26, 1996 Soil Boring/Surface Sample Investigation Report from McLaren/Hart. Appendix A, however, only includes a portion of that report, namely the Area 1 Boring Logs and Area 1 Soil Boring Downhole Gamma Logs. DNR recommends using all information provided in the McLaren/Hart report, including analytical sample results, to fully understand the nature and extent of RIM for purposes of selecting the location of an isolation barrier. In particular, data from previous borings WL-107; WL-109A, B, C and D; WL-110; WL-121; WL-122; WL-123 and any others near the isolation barrier area should be included in this report. Cross sections from the McLaren/Hart report may also be useful to verify geotechnical properties (i.e. depth to bedrock).

Finally, due to the discontinuous nature of RIM identified in the Phase 1 Report, a statistically defensible sampling plan should be used to fully characterize the nature and extent of RIM prior to selection of an isolation barrier location and to select a final remedy for Operable Unit 1. Any data gaps from previous investigations should be considered in development of future sampling plans to ensure complete characterization.

2. Conceptual Model Confirmation:

DNR generally agrees with using resources such as historical aerial photography, documented landfill boundaries, historical excavation projects and site activities, etc. to develop a conceptual model for identifying potential areas of contamination. However, the Phase 1 Report seems to arbitrarily use sampling data along with the 1971 and 1975 topographic contour maps to bound the possible extent of RIM associated with Area 1 to this topographic surface interval. In instances which RIM does not fall within the 1971 and 1975 topographic surface interval; resolution issues, regrading, and quarrying activities are given as reasons for the anomalies. For these reasons and considering historical uses of the site, it is important to confirm the conceptual model with statistically defensible sampling locations. Please provide copies of the 1971 and 1975 orthorectified digital images at their original resolution.

In addition, areas of site construction/demolition such as the transfer station, Shuman building and other site structures should be investigated for potential RIM relocation. Equipment traffic across Areas 1 and 2 during and after placement of RIM should be considered as a potential for RIM transport. The possibility of RIM stockpiles used as daily cover post-1975 should also be considered.

3. GCPT Calibration:

Section 3.2.2 and 3.3.2 focus on correlation to previous sampling locations. DNR is confused why this is called "calibration" when the instrument was not necessarily calibrated to previous gamma readings. Please consider renaming these sections. Was any actual calibration of the Gamma Cone Penetration Test (GCPT) necessary? If so, please describe. There are other sections that discuss procedures using a lead sleeve and potassium carbonate cylinder to check gamma response. Please elaborate on the purpose of these procedures and include the results. Also include a discussion on GCPT logging intervals and advancement rates. More discussion on correlation between the two GCPT rigs used is also needed.

4. Potentiometric Surface Maps:

Section 7.2 discusses pore pressure dissipation tests and dynamic pore pressure measurements from the GCPT to determine zones of continuous saturation. Please utilize these measurements (Table 10) and any actual water level measurements to develop a potentiometric surface map of Area 1. This information can also be used to select the optimum location for the replacement of well D-14.

5. Figures:

Overall, the figures in the Phase 1 Report should be revised to better represent the extent of RIM. Visual representation using color coding of borings for ranges of downhole gamma readings and polygons to delineate areas of elevated radiological activity similar to figures provided in the Remedial Investigation Report would be helpful. Once characterization of RIM is complete, the Area 1 boundary should be revised to reflect such. The proposed isolation barrier locations would also be helpful.

SECTION SPECIFIC COMMENTS

6. Section 2.1 Pathway Vegetation Clearing: The last sentence on page 11 states, "No areas containing surface RIM were encountered during the clearing operation." It is not clear whether no surface RIM was found or if surface RIM was avoided during selection of pathways.
7. Section 2.1 Pathway Vegetation Clearing, page 12: The fourth sentence of the last paragraph of the section states, "This vegetation was placed to the side of the path". Please describe the size and amount of cleared vegetation that was relocated. Any pictures of this activity would be helpful.
8. Section 2.3 Surveying, page 13: The last sentence of the section states, "This information was also recorded by the surveyor in a field book or data logger." Please provide copies of all field notes.

9. Section 2.4 Inert Fill Material, page 13: The fifth sentence states, "Since closure of Area 1 in 1974, placement of inert fill material pursuant to the 2006 Material Management Plan was the only time fill was placed in this area." DNR questions the validity of this statement. The fact that municipal waste was placed above locations of identified RIM refutes this statement. Also please provide documentation of the 1974 Area 1 closure mentioned in this statement.
10. Section 3 Gamma Cone Penetration Test Investigation, page 14: The first sentence of the last paragraph states, "Results obtained during the Phase 1 investigation indicated the presence of unanticipated elevated gamma levels (over 200 cps) in some of the GCPT soundings in the southwestern portion of Area 1." Please explain how the 200 cps screening level was developed. Is this considered background? If so, what data was used to verify this as a background reading?
11. Section 3 Gamma Cone Penetration Test Investigation, page 15: The second to last sentence of the section states, "This resulted in the submission and approval of a Phase 1B, 1C and 2 Work Plan to further delineate apparent elevated gamma readings in the western portion of Area 1 and to determine the bottom of refuse in the eastern portions (FEI, 2013)." Please reference the final version (Revision 1) of this work plan which is dated January 8, 2014. Please add this document and associated addendums to Section 8 References.
12. Section 3.1 Goals of the GCPT Investigation, page 15: The first sentence states, "The goals of the investigation were to gather the required geotechnical data for design and to document if the filled material within the proposed excavation area for the potential thermal isolation barrier alignment contained radiologically impacted material above an appropriate threshold value." Please list the threshold values or reference where they can be found in the document.
13. Section 3.2.1 Overview, page 15: The last sentence of the second paragraph states, "In addition, a background reading was also obtained before each sounding by inserting the tool string into a thick lead shield cylinder." Use of the term "background" for this procedure is confusing. Background readings usually refer to radiation from natural sources. Please consider revising this statement to describe the actual intent of this procedure. Also please include results of this procedure.
14. Section 3.2.4 Phase 1A Investigation: The second last statement states, "The operators backfilled the hole with bentonite pellets and inserted an 'as-built' flag, with the sounding name, within the actual boring location." The Gamma Cone Penetration Tests (GCPT) Work Plan, Revision 2, states that each sounding hole will be filled with short hydrated lifts of bentonite pellets. Please verify that this method was used to ensure the entire boring was filled with bentonite and that no bridging occurred.
15. Section 3.2.5 Phase 1A Results, page 17: The second sentence of the second paragraph states, "A screening value of 200-250 cps was used to identify potentially elevated gamma readings." Please explain how the 200-250 cps screening level was developed (see Comment #10).

16. Section 3.3.2 GCPT Calibration, page 19: The first sentence states, "Even though ConeTec, Inc. used the same gamma module as was used in the Phase 1A investigation, the EPA On-Scene Coordinator requested a demonstration of calibration since a new GCPT rig was being used." Was the screening value of 200-250 cps also re-evaluated for the new GCPT rig? See previous comment.
17. Section 3.3.2 GCPT Calibration, page 20: The first sentence on the page states, "Before each hole, the gamma sensor was placed in a lead-shielded cylinder to establish background and was then placed in a cylinder containing potassium carbonate for the purpose of performing a response check to ensure the gamma sensor was working properly." Use of the term "background" for this procedure is confusing (see Comment #13). What was the expected response check for the potassium carbonate? Please include validation readings using the potassium carbonate (see General Comment #3).
18. Section 3.3.4 Phase 1B Investigation, page 20: The second sentence of the first paragraph states, "In addition, due to shallow refusals in some of the 13 and 14 path series Phase 1A GCPTs, the following GCPT soundings were advanced after a sonic rig drilled seven 10-foot deep 'pilot holes' through the construction and demolition waste described in Section 2.4." According to Section 1.2.2 of the Phase 1B, 1C, and 2 Work Plan – Revision 1, "...additional drilling is required to evaluate the nature of the materials responsible for GCPT refusal in this area and to verify the absence of RIM..." Please include this information. Also please describe if any inert material was used in the "pilot holes" to prevent borehole collapse prior to returning with the GCPT.
19. Section 3.3.5 Phase 1B Results, page 21: The second sentence of the second paragraph states, "A screening value of 200-250 cps was used to tentatively identify possible RIM." Please explain how the 200-250 cps screening level was developed (see Comments #10 and #15). Also please explain what is meant by use of term "tentatively".
20. Section 4.2 Sonic Drilling, page 24: The last sentence of the section states, "Core samples were hydraulically extracted from the sample barrel to reduce distortion." Please elaborate on this process and describe whether any investigative derived waste was generated in this process.
21. Section 4.2.1 Sonic Drilling Procedure, page 24: The fourth sentence of the third paragraph states, "The PVC pipe was secured at the surface with a temporary support device to prevent the pipe from rising out of the borehole due to buoyancy effects." Please elaborate on the design of the support device. Also, please include a list of borings which experienced the buoyancy effects. Was the water level measured in these borings?
22. Section 4.2.4 Borehole Gamma Logging, page 26: The first sentence states, "Once the borehole reached its total depth, a temporary 2-inch diameter PVC sleeve was inserted into the hole to prevent its collapse." Use of the term "sleeve" indicates the PVC pipe was open on both ends. Section 4.8.1 of the Phase 1B, 1C and 2 Work Plan – Revision 1 calls for a "2 ½ inch minimum solid PVC pipe with a bottom cap" to be used. Please clarify.

23. Section 6.1 Development of Historical Topography Maps, page 35: The second bullet refers to "the latest geoidal model". DNR is not familiar with this term. Please define and specify which model this refers to.
24. Section 6.1 Development of Historical Topography Maps, page 36: The second last sentence of the second paragraph states, "Surdex produced orthorectified digital aerial image tiles consistent with the shapefile area of OU-1." Please provide copies of the digital images and OU-1 shapefile.
25. Section 7.1.2 GCPT Strata Evaluation, page 38, third paragraph: Should the reference be Figures 19 & 20?
26. Section 7.3.6 Sonic 1-2, page 41: The fourth sentence states, "Therefore, this sample was found approximately between 7.9 and 8.9 feet below the 1971 surface." Is there any explanation how this sample of elevated thorium arrived at that depth?
27. Section 7.3.7 Sonic 1C-6, page 41: The last two sentences state, "Apparently there was grading work performed between 1971 and 1975. Therefore, with the tolerance of the estimated topographic elevations based on the historical aerial photogrammetry, these samples could have been obtained from an interval between the 1971 and 1975 topographic surfaces." The potential for regrading and elevation tolerances supports the need to confirm the conceptual model with statistically defensible sampling locations (see General Comment #2).
28. Section 7.3.9 Sonic 8-1A, page 42: The last sentence states, "However, as can be seen from the 1971 topography (see Figure 9), site 8-1 was near the active quarrying activities, so the 1971 surface may have been quarried further before filling-in commenced and thus landfilling of material at this elevation in 1973 is plausible." Site 8-1 is located a considerable distance north of the North Quarry high wall. Therefore, DNR is not convinced quarrying activities were conducted in this area. Is there another possible explanation for elevated thorium to be present at this depth?
29. Section 7.3.10 Sonic 15-2, page 42: The last two sentences state, "However, as can be seen from the 1975 topography (see Figure 10), site 15-2 was near the active quarrying activities, so RIM material may have been pushed from other sites to this site during grading after the RIM materials were received in 1973. In addition, the 1971 and 1975 topography have a resolution of 2 feet, so this could be a resolution issue." The potential for regrading and elevation tolerances supports the need to confirm the conceptual model with statistically defensible sampling locations (see General Comment #2).
30. Section 7.4.5 Cross Section E-E', page 45: The last sentence states, "However, this layer is bound to the south by GCPT 6-5, and WL-107 aids in the confirmation of no RIM materials south of GCPT 6-6." Would GCPT 1C-12, which encountered RIM, be considered south of GCPT 6-6? Also, please include analytical data from WL-107 that supports this statement.

31. Section 7.5 Summary of Observations, Item #3, page 46: This item summarizes observations of GCPT gamma readings. Does the summary take into account downhole gamma readings from Sonic borings? If not, where will the downhole gamma data be summarized?
32. Section 7.5 Summary of Observations, Item #7, page 47: The last sentence states, "Based on the overall insolubility of thorium, these occurrences may reflect drag-down during drilling." What is the certainty that drag-down occurred? This suggests that cross contamination occurred which may call into question validity of all the data.
33. Table 1 – Phase 1A GCPT Summary: Please provide a similar table of maximum gamma readings for downhole gamma logging.
34. Figure No. 14, Cross Section D-D': The profile for GCPT 1C-12 shows alluvium well above the 1971 ground surface elevation greater than tolerances of 2 feet. Please explain this discrepancy.
35. Appendix C3 – Sonic Downhole Borehole Log and Core Scan: Boring WL-119 shows a maximum gamma response of 7,941 cpm at 32.5 ft but no sample was collected from this interval even though the bore logs show sufficient recovery using sonic coring (38/120 inches of recovery). Please explain why a sample was not collected for laboratory analyses from this interval of the sonic core.